

(Press Release)

NTT Corporation

"Inclusive Core" network in the 6G/IOWN era

Realizing a core network incorporating the Emerging technology concepts of "In-Network Computing" and "SSI"

Tokyo –October 25, 2023 – NTT Corporation (NTT) has established basic technical specifications for the core network, "Inclusive Core" architecture for the 6G/IOWN era, and conducted demonstration experiments using the Metaverse as a use case to confirm its effectiveness. We also published a white paper on this technical specification. The Inclusive Core will significantly change role of core network by incorporating technology concepts such as In-Network Computing ^[1] and Self-Sovereign Identity (SSI) ^[2], which are expected to be widely used in the future, into the core network. This enables users to have a comfortable, secure, and secure experience by reducing terminal processing load and protecting user privacy for services used over the network.

These results will be exhibited at the NTT R&D Forum - IOWN ACCELERATION^[3], which will be held from November 14th to 17th, 2023.



Figure 1 Inclusive Core Overview



1. Background

Currently, many services are provided through the network as various things are connected to the network and digitized. In the future, services will become more diverse, and advanced services such as CPS^[4] are expected to be realized in the 6G/IOWN era.

Traditional networks have transferred information independently of information processing in cloud services and on terminals. While the information processing of various services is advanced in cloud services and terminals, the network configuration has not been agile and limited its features only to data transfer, which can cause the restrictions for the area of advanced services and terminals. In addition, while digitized personal information (digital identity) is becoming more prevalent and it is expected to be used in advanced services, the digitization of such personal information raises concerns about unintended collection of personal information, identification of individuals through collation of collected information, and abuse of personal information.

2. Inclusive Core Technology Overview

The Inclusive Core aims to become a common foundation for the future, consisting of various technologies that realize the four multifaceted "integration and cooperation" as communication services themselves or environmental changes, such as "cyberspace" and "physical space", "computing" and "networking", "analog" and "digital", "mobile communication" and "fixed communication". Specifically, it is composed of such elemental technologies as "In-network Service Acceleration Platform (ISAP)," "Highly resilient network technology (robust network)", "Ability to select communication methods that adapt to application requirements (adaptive transport)", "Authentication functions for various objects such as things and AI, and ID linkage functions (authentication and ID linkage functions) between terminals, networks, and services" and "User sovereignty identity management and information distribution infrastructure (SSI platform)" (For details, refer to the white paper) *. In this demonstration, we implemented a core network that incorporates the budding technology concepts of In-Network Computing and SSI, which are the proposed architecture with respect to the elemental technologies ISAP and SSI platform.

As an In-Network Computing enabling technology, ISAP mediates information processing related to services on terminals and in cloud services, and forms a cascading computing environment on hardware in the network that is suited to the communication environment and the service usage environment, while synchronizing and coordinating both extremely fast. The network cooperates and speeds up information processing between terminals and cloud services anytime and anywhere, leading to the creation of flexible service experiences that are not restricted by customer environments, terminals, or services. ISAP enables a range of advanced services, regardless of terminal specifications or access environment, and for the application service providers, ISAP brings the benefit of expand the variety of users.

The SSI platform combines Decentralized Identifiers (DID)^[5] and Verifiable Credentials (VC)^[6],



technologies that enable SSI, including blockchain, with technologies that conceal information, e.g., IP addresses, that can identify users, to securely present privacy-sensitive personal credentials. This makes it possible to securely use personalized services without fear of collecting digitized personal privacy information.

3. Details of demonstration

To verify the effectiveness and prove the feasibility of the above architecture, we implemented an inclusive core on AWS and demonstrated the following points about the elemental technologies ISAP and SSI infrastructure using the metaverse as an example use case.

Demonstration of immediate deployment of metaverse space rendering application with In-Network Computing infrastructure in conjunction with metaverse space state: In accordance with the movement to the metaverse space based on SSI, which is connected as a space that can be moved from MetaMe^[7] (MetaMe community world), ISAP cooperates the metaverse space state with the terminal connection state of the 5G core network deployed on AWS, and demonstrates the fast and complicated 3D space rendering application by dynamically activating its container the metaverse space drawing function to hardware accelerators in the network.



Figure 2 ISAP Demonstration

• SSI-based metaverse demonstration of personalized content delivery without collecting personal privacy information:



The Secure ID Wallet, which manages personal privacy information deployed on ISAP, enables privacy-conscious presentation of personal attribute information, and demonstrates the provision of personalized services based on personal attribute information while preventing the collection of personal information that identifies individuals in the metaverse



space.



4. Outlook

Through this demonstration, we have confirmed that we can present a new form of service in which users can take the initiative, so that they can safely and securely use the service they want to use anytime and anywhere without being influenced by terminals or services.

In the future, these elemental technologies will be proposed to relevant international standards bodies and open source communities. In 2030, when the full-scale introduction of 6G/IOWN is scheduled, we aim to have it widely implemented in society as a standard specification.

< Papers >

[*] White Paper on Inclusive Core Technical Specifications https://www.rd.ntt/e/ns/inclusivecore.html

< Glossary >

[1] In-Network Computing:

This technology concept transfers the processing function of the application layer to the data transfer function in the network, and achieves high-performance and high-functional services while



reducing latency and terminal power consumption. Offloading information processing to switches and other devices in the network is expected to reduce terminal load.

[2] Self-Sovereign Identity (SSI):

A technology concept associated with Web3.0 that enables individuals to own and control their own digital identity. SSI provides a mechanism for users to securely manage their information without having to rely on a central administrator or certification authority.

[3] "NTT R & D FORUM 2023 -IOWN ACCELERATION" Official Website:

https://www.rd.ntt/forum/

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[4] Cyber-Physical System (CPS):

Refers to a system that blends the physical world (Physical) with the digital world (Cyber). These systems combine sensors, actuators, data processing, and communication technologies to collect, analyze, and control information in real time. CPS is expected to be used in many applications such as autonomous vehicles, smart cities, and industrial robots.

[5] Decentralized Identifiers (DID):

Decentralized Identifiers are the underlying element of SSI and are unique digital identifiers. DID is independent of a central authority and uses technologies such as blockchain to help users uniquely identify themselves.

[6] Verifiable Credentials (VC):

Verifiable Credentials are digital representations of a person's skills, qualifications, attributes, and other information that provide evidence to verify authenticity. VCs are used in conjunction with SSIs to ensure that credentials can be shared in a reliable manner.

[7] MetaMe:

Relic Co., Ltd., a business co-creation company developed by NTT DOCOMO, INC. (President and CEO Motoyuki li, Chiyoda-ku, Tokyo, hereinafter DOCOMO) that supports new business development and innovation creation by Japanese companies, operates a meta-communication service utilizing the incubation partner platform (Head Office: Shibuya-ku, Tokyo Representative Director and CEO: Takahiro Kitajima; hereinafter, Relic) that accelerates the creation of new businesses by large companies as part of Relic's Open Innovation Business. The service was launched in February 2023. ("MetaMe" official site https://p.metame.ne.jp)

About NTT

NTT contributes to a sustainable society through the power of innovation. We are a leading global technology company providing services to consumers and business as a mobile operator, infrastructure, networks, applications, and consulting provider. Our offerings include digital



business consulting, managed application services, workplace and cloud solutions, data center and edge computing, all supported by our deep global industry expertise. We are over \$95B in revenue and 330,000 employees, with \$3.6B in annual R&D investments. Our operations span across 80+ countries and regions, allowing us to serve clients in over 190 of them. We serve over 75% of Fortune Global 100 companies, thousands of other enterprise and government clients and millions of consumers.

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